

REMARKS/ARGUMENTS

Claims 1, 3-8 and Claims 11-16 are active in the case. Reconsideration is respectfully requested.

Applicants representative wishes to thank Examiner Gillespie for the helpful and courteous interview of October 12, 2007. As a result of the discussion it is believed that the issues in the case have been clarified and that the prosecution of the application has been materially advanced.

The present invention relates to a process of preparing a radiation-curable urethane (meth)acrylate.

Claim Rejection, 35 USC 112

It is believed that the objection to the term "partly reacting" in Claims 1 and 14 is overcome by the amendment to each of the claims which specifies that the esterification reaction continues until at least 75 % of the water product that is produced by the esterification process has been formed by the reaction Basis for this limitation can be found in the first two lines of page 14 of the specification. Entry of the amendment is respectfully requested.

The weight ranges of Claims 11 and 12 have been reversed so that the subject matter of the range of Claim 12 properly falls within the molar ratio range of Claim 11. Further, Claim 13 has been amended to recite quantitative ranges of fully esterified alkoxylated polyol (A) relative to the range of unesterified or partly esterified alkoxylated polyol (A) and specify the total amount of esterified, unesterified and partly esterified polyol as 100 %. The percentage amounts of the unreacted (meth)acrylic acid, esterification catalyst and polymerization inhibitor are then based on the 100 % amount of esterified, unesterified and

partly esterified polyol material that is formed in the esterification reaction. Accordingly, the problem of the greater than 100 % amount of all components of the reaction is resolved.

Claim Rejection, 35 USC 103

Claims 1, 3-8, 11, 12 and 14-16 stand rejected based on 35 USC 103(a) as obvious over Lokai et al, U. S. Patent 6,319,983 in view of Neuhaus et al, U. S. Patent 4,380,604. This ground of rejection is respectfully traversed.

As stated previously, the Lokai et al patent discloses a method of making radiation-curable urethane (meth)acrylates by a several step process in which in a first step, at least one hydroxyl-containing compound is reacted with (meth)acrylic acid in a solvent to form an ester, and then the solvent is removed and optionally a part of the unreacted (meth)acrylic acid. The mixture obtained is subsequently reacted with at least one epoxy-functional compound in an amount that corresponds to the acid number of the mixture, and then this material is reacted with at least one compound that contains isocyanate groups. It is worth noting that in the procedure of Lokai et al a compound containing at least one epoxy group is reacted with the ester that is formed before an isocyanate compound is added to the product for further reaction to complete the urethane product. This means that the hydroxyl groups in the material that has been formed prior to the reaction with isocyanate are present in residues of the polymer material which were a part of the epoxide group containing reactant, and probably not many hydroxyl groups that were originally a part of the hydroxyl group containing ester of (meth)acrylic acid since they would have reacted with the added epoxy group containing compound. The Examiner states in paragraph 7 of his Action that it would have been obvious to one of skill to replace the reactive diluents disclosed in Lokai et al with the hydroxyalkyl(meth)acrylates in order to achieve a variety of improved effects. However, where in the scheme of the several process steps would one of skill in the art add a

hydroxyalkyl(meth)acrylate; before reaction of the epoxide with the partial (meth)acrylate ester, or after reaction of the ester with the epoxide compound? The point of such an addition would have a marked impact on the properties of the resulting urethane polymer product. In Neuhaus et al, hydroxyalkyl (meth)acrylate together with the ethylenically unsaturated partial ester is reacted with the isocyanate reactant. This one step reaction is quite unlike the teaching of Lokai et al where two steps of reaction are disclosed of an initial reaction of epoxide group containing compound with hydroxyl group containing ester, and then reaction of the first stage product with isocyanate.

The Examiner states that the Lokai et al patent discloses reactive diluents. Indeed, Lokai et al at column 8 discloses such reactive diluents as the esters of suitable diols, triols, and/or tetrols with acids such as maleic acid, fumaric acid, tetrahydronaphthalic acid, crotonic acid and the like. Both Lokai et al and Neuhaus et al disclose the art known use of reactive diluents in order to “establish appropriate processing viscosities” (reduce viscosities). Such compounds are compounds which contain no reactive groups other than (meth)acrylic groups, as is clear from the immediate prior discussion. Preferred compounds are the multiple double bond containing esters of diols, triols and tetraols of (meth)acrylic acid. Note that the patent does not disclose the mono- esters of (meth)acrylic acid such as 2-hydroxy(meth)acrylate, which is a preferred hydroxyalkyl (meth)acrylate (K) compound of the present claims. By contrast, in the present invention, obligatory component (K) is a hydroxyalkyl (meth)acrylate such as 2- hydroxyethyl (meth)acrylate. The compound does not react as a reactive diluent, but is an obligatory part of the urethane (meth)acrylate product that is formed. Moreover, as a means of providing a remedy for having to use the costly reactive diluents, Lokai et al states in column 1, lines 25-27 that it is known in the art to use aqueous radiation-curable binder dispersions. As to Neuhaus et al, this reference also teaches the desirability of avoiding the use of reactive diluents, and does so, as stated at column 2, lines 12-34, by preparing low-

viscosity coating compositions that are formulated from the reaction product of ethylenically unsaturated partial esters that contain hydroxyl groups which formally are the esters of (meth)acrylic acid and at least a trifunctional alcohol. The esters are reacted with a polyisocyanate. Note at column 2, lines 33-34, hydroxyalkyl (meth)acrylates are an optional component. Clearly, therefore, it is not essential that hydroxyalkyl (meth)acrylates be present as a reactant in the formulation that is described in order to obtain a low viscosity composition. In view of this discussion, applicants do not concur that one of skill in the art would be led by the references to incorporate the hydroxyalkyl (meth)acrylates disclosed in Neuhaus et al in the procedure of Lokai et al so as to, in effect, arrive at the urethane (meth)acrylate of the present invention.

Applicants also submit that comparative evidence in the examples of the specification support applicants' arguments for patentability, as such was discussed at the interview. Performance tests were conducted on several examples of coating compositions and the results are shown in the table on page 33. Example B1 is within the scope of the present invention because it was prepared from Precursor B which is reacted hydroxyethyl acrylate and toluene diisocyanate (Urethane acrylate B1). Urethane acrylate A1 seems to be consistent with the disclosure of Neuhaus et al, because the ester of Precursor A is not reacted with an epoxy compound, while Urethane acrylate B2 seems to be consistent with the disclosure of Lokai et al, because the isocyanate component is not reacted with the product of step (c) along with a hydroxyalkyl (meth)acrylate compound. The superior abrasion resistance results for the Urethane acrylate B1 of the invention over the other two urethane acrylates that are consistent with the prior art are supportive of the patentability of the invention as claimed. Withdrawal of the rejection is respectfully requested.

Claims 1, 3-8 and 11-16 stand rejected based on 35 USC 103(a) as obvious over Lokai et al, U. S. Patent 6,319,983 in view of Neuhaus et al, U. S. Patent 4,380,604 and

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further in view of Paulus et al, U. S. Patent 6,458,991 . This ground of rejection is respectfully traversed.

Applicants maintain their position with respect to the Lokai et al and Neuhaus et al patents as stated above, that the combined references does not suggest the invention as claimed.

As to Paulus et al, the disclosure of substrates such as wood, paper and the like is a secondary aspect of the invention upon which patentability does not depend. The reference, in fact, does not overcome the short-comings of the primary references with respect to the invention as claimed and withdrawal of the rejection is respectfully requested.

It is now believed that the application is in proper condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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